

## 두개강내 해면혈관종 76례 치료성적

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### Management of Intracranial Cavernous Malformation : A Retrospective Analysis of 76 Consecutive Cases

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**Objective :** To establish a treatment guideline for intracranial cavernous malformation, the authors analyzed the clinical features, treatment modality, complications, and late outcomes in 76 consecutive cases (45 microsurgical resections, 30 stereotactic radiosurgeries, one microsurgery followed by radiosurgery) managed at the Yonsei University Medical Center from 1985 to 1998.

**Results :** Among 104 lesions in 76 patients, 64 (61.5%) lesions were supratentorial and 40 (38.5%) infratentorial. Hemorrhage was the most common presentation (31 patients, 40.8%), followed by generalized seizure (15 patients, 19.7%). Fifteen (19.7%) patients had mixed presentation with generalized seizure and hemorrhage, while 9 (11.9%) patients presented focal deficits. The remaining 6 (7.9%) patients had headache or incidental lesion. Almost all infratentorial lesions (92.5%) were managed with radiosurgery, and 65.6% of supratentorial lesions with microsurgery. The average follow-up period was 14.6 months for the microsurgery group and 32 months for the radiosurgery group. The overall outcome was good in 68 (89.5%), fair in 6 (7.9%), poor in 1 (1.3%), and dead in 1 (1.3%). Total microsurgical resection and symptomatic cure rate was 95.6%. Two lesions were incompletely resected. One lesion was followed by radiosurgery and the other was followed by reoperation. Only 38.5% of lesions with radiosurgery were shrunk.

**Conclusion :** Microsurgical removal is effective for lesions in the non-eloquent area, or with recurrent hemorrhages and seizures. Although radiosurgery could be considered for lesions with multiplicity in the eloquent or deep-seated area, further study for the radiosurgical effect on cavernous malformations is required.

**KEY WORDS :** Cavernous malformation · Intracranial hemorrhage · Seizure · Management.

## 서 론

가

14,32,46)

5~10%

24,23,32)

21,22,25)

가

가 가

(natural history)

## 대상 및 방법

1985 1998

76 , 104

Data-

base

45

30

58

(eloquent area),

(deep area)

. 58

2

Linear Accelerator

, 56

Gamma - Knife

. 1

Maximal dose 18~50Gy

31.5Gy

Isodose line

50%

가

가

0%

(complete regression), 20%

(partial shrinkage),

가

(no response),

(enlarged)

가

**Table 1.** Location and treatment modality\*(n=104 lesions)

| Location        | Treatment modality(%) |              |        | Total      |
|-----------------|-----------------------|--------------|--------|------------|
|                 | Microsurgery          | Radiosurgery | MS+RS* |            |
| Cerebral cortex | 39                    | 17           | 1      | 57(54.8)   |
| Cerebellum      | 1                     | 22           |        | 23(22.1)   |
| BG, thalamus    |                       | 3            | 4      | 7( 6.7)    |
| Brain stem      | 2                     | 15           |        | 17(16.4)   |
| Total           | 45(43.3)              | 58(55.8)     | 1(0.9) | 104(100.0) |

\*MS : Microsurgery, RS : Radiosurgery, BG : Basal Ganglia

**Table 2.** Location and presentation\*(n=104 lesions)

| Location        | Presentation(%) |          |          |                |            | Total      |
|-----------------|-----------------|----------|----------|----------------|------------|------------|
|                 | Hemorrhage      | Seizure  | Mixed    | Focal-deficits | Incidental |            |
| Cerebral cortex | 19(33.4)        | 16(28.1) | 15(26.3) | 1( 1.7)        | 6(10.5)    | 57(54.8)   |
| Cerebellum      | 2( 8.7)         |          |          | 2( 8.7)        | 19(82.6)   | 23(22.1)   |
| BG, thalamus    | 4(57.1)         | 3(42.9)  |          |                |            | 7( 6.7)    |
| Brain stem      | 10(58.9)        |          |          | 7(41.1)        |            | 17(16.4)   |
| Total           |                 |          |          |                |            | 104(100.0) |

\* : BG : Basal Ganglia

(good outcome),

(fair outcome),

(poor

outcome),

(dead outcome or vegetative)

## 결 과

2~68

32.9

, 30

가

1.45 : 1

104

가 64

40

가

, 23

(22.1%),

17

(54.8%),

7

(6.7%)

2/3(39

; 68.4%)

1/3(17

; 29.8%)

(Table 1).

76

31

(40.8%) 가

, 15 (19.7%),

15 (19.7%),

9 (11.9%),

6 (7.9%)

(MRI)

(overt hemorrhage)

가

2/3

, 1/3

(Table 3).

57

19 (33.4%),

16 (28.1%),

15 (26.3%)

1 (1.7%),

6 (10.5%)

23

**Table 3.** Presentation and treatment modality\*(n=76)

| Presentation   | Treatment modality(%) |              |        | Total     |
|----------------|-----------------------|--------------|--------|-----------|
|                | Microsurgery          | Radiosurgery | MS+RS* |           |
| Hemorrhage     | 20                    | 11           |        | 31(40.8)  |
| Seizure        | 5                     | 9            | 1      | 15(19.7)  |
| Mixed          | 14                    | 1            |        | 15(19.7)  |
| Focal deficits | 2                     | 7            |        | 9( 7.9)   |
| Incidental     | 4                     | 2            |        | 6( 7.9)   |
| Total          | 45(59.2)              | 30(39.5)     | 1(1.3) | 76(100.0) |

\* : MS : Microsurgery, RS : Radiosurgery

**Table 4.** Microsurgical resection(n=46)

| Resection  | N  | %     |
|------------|----|-------|
| Incomplete | 2* | 4.4   |
| Complete   | 44 | 95.6  |
| Total      | 46 | 100.0 |

\*1 paraventricular lesion : followed by radiosurgery

1 cerebral subcortical lesion : repeated surgery

\*no postoperative rebleeding

**Table 5.** Lesion regression rate(radiosurgery : n=26)

|                     |           |
|---------------------|-----------|
| Complete regression | -         |
| Partial shrinkage   | 10( 38.5) |
| No response         | 14( 53.8) |
| Enlargement         | 2( 7.7)   |
| Total               | 26(100.0) |

**Table 6.** Presentation and outcome(n=76)

| Presentation   | Outcome(%) |         |        |         | Total     |
|----------------|------------|---------|--------|---------|-----------|
|                | Good       | Fair    | Poor   | Dead    |           |
| Hemorrhage     | 26(83.9)   | 4(12.9) | 1(3.2) |         | 31( 40.8) |
| Seizure        | 15( 100)   |         |        |         | 15( 19.7) |
| Mixed          | 15( 100)   |         |        |         | 15( 19.7) |
| Focal deficits | 6(66.7)    | 2(22.2) |        | 1(11.1) | 9( 7.9)   |
| Incidental     | 6( 100)    |         |        |         | 6( 7.9)   |
| Total          | 68(89.5)   | 6( 7.9) | 1(1.3) | 1( 1.3) | 76(100.0) |

19 (82.6%) 가  
2 (8.7%), 2 (8.75%)  
19 17  
7  
4 (57.1%), 3 (42.9%) , 17  
10 (58.9%), 7 (41.1%)  
(Table 2).  
46 2  
, 44  
2 가  
(Table 4).

**Table 7.** Location and outcome\*(n=76)

| Location        | Overall outcome(%) |         |        |        | Total     |
|-----------------|--------------------|---------|--------|--------|-----------|
|                 | Good               | Fair    | Poor   | Dead   |           |
| Cerebral cortex | 49(96.1)           | 2( 3.9) |        |        | 51( 67.1) |
| Cerebellum      | 3(100)             |         |        |        | 3( 22.1)  |
| BG, thalamus    | 5(71.4)            | 2(28.6) |        |        | 7( 6.7)   |
| Brain stem      | 11(73.3)           | 2(13.3) | 1(6.7) | 1(6.7) | 15( 19.7) |
| Total           | 68(89.5)           | 6( 7.9) | 1(1.3) | 1(1.3) | 76(100.0) |

\* : BG : Basal Ganglia

**Table 8.** Treatment modality and outcome(n=76)

| Modality     | Outcome(%) |        |        |        | Total     |
|--------------|------------|--------|--------|--------|-----------|
|              | Good       | Fair   | Poor   | Dead   |           |
| Microsurgery | 41(91.1)   | 4(8.9) |        |        | 45( 59.2) |
| Radiosurgery | 26(86.7)   | 2(6.7) | 1(3.3) | 1(3.3) | 30( 39.5) |
| Combined     | 1( 100)    |        |        |        | 1( 1.3)   |
| Total        | 68(89.5)   | 6(7.9) | 1(1.3) | 1(1.3) | 76(100.0) |

**Table 9.** Causes of unfavorable outcome(n=76)

|                         | Fair   | Poor   | Dead   | Total   |
|-------------------------|--------|--------|--------|---------|
| Initial insult          | 4      | 1      |        | 5       |
| Rebleeding/radiosurgery |        |        | 1      | 1       |
| Radiation injury        | 1      |        |        | 1       |
| Systemic complication   | 1      |        |        | 1       |
| Total                   | 6(7.9) | 1(1.3) | 1(1.3) | 8(10.5) |

30 MRI  
26 26  
10 (38.5%), 14 (53.8%),  
2 (7.7%)  
(absorption) (Table 5).  
76 68 (89.5%), 6 (7.9%),  
1 (1.3%), 1 (1.3%)  
6 , 1 ,  
1  
가 (Table 6).  
가 51 49 (96.1%)  
, 2 (3.9%)  
7 5 (71.4%) , 2 (28.6%)  
15 11 (73.3%),  
2 (26.7%), 1 (13.3%), 1 (13.3%)  
가 (Table 7).  
14.6  
32

45 41 (91.1%), 4 (8.9%) ,  
 30 26 (86.7%),  
 2 (6.7%) , 1  
 (Table 8).  
 76 8 (unfavorable  
 outcome) . (initial insult)  
 5 , , (ra-  
 diation injury), (systemic complication)  
 1 (Table 9).

## 고찰

가  
 ,  
 0.1~4.0%, 0.02~0.53%  
 가 1,11,14,22,25,27,33,38,46)  
 (MRI series) 0.39~0.47% 27,33)  
 30 가 가  
 가 ,  
 38,40,41)  
 가  
 5,11,38,46)  
 가 1928 Kufs  
 17),  
 (autosomal dominant trait)  
 3,8,10,16)  
 가 가 29,46) 가  
 . 가  
 84% , 가  
 10~15%  
 31,32,46)  
 hemosiderin , (iron)  
 (epileptogenic material)  
 가  
 15) Robinson 31) 66  
 , ,  
 ,

4). Curling 5) MRI  
 1 1.51% , 1 1 1.3%,  
 2.48% .  
 6.0~30.8% 11.6% 31,38,41)  
 (overt hemorrhage)  
 1 1 0.3~0.8%  
 (morbidity) (mortality)  
 5,31)  
 1 1 2.3~25%  
 .  
 8,30,45)  
 , Cur-  
 ling 5) 32 1 1  
 0.1% 가 , Robinson 31)  
 1 1 0.7% . Zab-  
 amski 46) 1 1 2.1%  
 1 1 1.2%가  
 . 1997 1990 1994  
 62 , 108 ,  
 (sympto-  
 matic hemorrhagic rate) 1 1 2.3%(1 1  
 1.4%) , (recurrent hemorrhage rate)  
 1 1 3.8%(1 1 2.6%) 8).  
 MRI가 가 (sensitivity)  
 (specificity)가 5,26,28) T2  
 (heavily T2 - weighted spin - echo images)  
 가 8). MRI  
 (the ring of low - signal intensity)  
 (a mixed signal " variegated " core)  
 (thrombosis)  
 ,  
 methemoglobin hemosiderin ferritin  
 8).  
 T1 T2 - weighted images  
 , T2 - weighted images

|                                   |   |                              |                           |
|-----------------------------------|---|------------------------------|---------------------------|
| T1                                | T2 - weighted images                                | 4                            |                           |
|                                   | T2 - wieghted images                                | 가                            |                           |
| 28)                               | MRI   |                              | 20,26,31,38,40)           |
|                                   | AOVM(angiographically occult vascular malformation) | 3                            | (first trimester) 가       |
|                                   |   |                              | 31)                       |
|                                   |   |                              |                           |
|                                   | (cl-  |                              |                           |
| inically significant hemorrhage), | (uncontr-   |                              | (transient complications) |
| ollable seizures)                 | (progore-   | 25~70% <sup>2,44,48)</sup> , | (permanent complications) |
| ssive neurologic deterioration)   |   | 25% <sup>2,39,44)</sup> ,    | 0~6% <sup>7,48)</sup>     |
|                                   | 12,17,35,43)  |                              | 가                         |
|                                   | 가   | 36)                          |                           |
|                                   | 가   | 가                            | 96.1% , 3.9%              |
|                                   | 가   |                              | 73.3%, 26.7%,             |
| 9,32,48)                          | 가   | 13.3%, 13.3%                 |                           |
|                                   | 가   |                              | 가                         |
|                                   | 가   | 2                            | (latency period)가 가       |
|                                   | 10,42)  |                              | 15,37)                    |
|                                   | 가   | Kondziolka <sup>15)</sup>    |                           |
|                                   | Zimmerman   | 5.6%                         | 2 8.8%                    |
| 48)                               | 16 1  | 가 가                          | 1.1%                      |
|                                   |   | Sepideh <sup>37)</sup>       | 17.4% 2                   |
| 46 2                              |   | 22.4% 가 가                    | 4.5%                      |
|                                   | 2 가   |                              |                           |
|                                   |   |                              | 가                         |
| angioma)                          | 가   |                              |                           |
|                                   | (venous   |                              |                           |
|                                   | (overt hemorrhage)                                  | 가 <sup>37)</sup> ,           |                           |
|                                   | 34)   | 가                            |                           |
|                                   | 가   |                              |                           |
|                                   | 48)   | 가 <sup>47)</sup>             |                           |
|                                   |   | 가                            |                           |
|                                   |   | 가                            | 18,19)                    |
|                                   | 34)   |                              |                           |
|                                   |   | 26 10 (38.5%)                |                           |
| Simard <sup>40)</sup> 23 12       |   | , 14 (53.8%)                 | , 2 (7.7%)                |
| , 9 , 2                           |   |                              |                           |
|                                   | (   |                              | (out-                     |
| ) 30 20                           |   | come)                        | 30 26                     |

1

Sepideh<sup>37)</sup>

26.5% , 16.3%

, 7.1% , 3.1%

가

가 Kondziolka<sup>15)</sup> 26%

, 4% , Duma

6) 27% , 18%

8 1

가

가

가

결 론

가

가

가

- : 1999 6 29
- : 1999 8 10
- :

120 - 749 134

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